

REQUEST FOR RECONSIDERATION

Applicants thank Examiner Johnson for the helpful and courteous discussion of December 9, 2003. During the discussion, Applicant's U.S. representative presented arguments that the prior art of record does not disclose the preparation of composites by mixing and heating a carrier powder and a metal hydroxide under inert gas to form a composite that exhibits no peak derived from the metal hydroxide in the X-ray diffraction intensity curve.

Applicants have disclosed an invention one aspect of which includes a composite and a method of making the composite that may include mixing a metal hydroxide and a carrier in powder form then heating and drying under a gas flow. The temperature at which the claimed method is carried out and at which the claimed composite is prepared may affect the performance characteristics of the resultant composite. If heating is carried out at 200°C or more the catalytic activity is reduced when the composite is used as an isomerization catalyst for olefins (page 8, lines 9-11). If the temperature at which the heating and drying is carried out exceeds 400°C the catalytic activity of the composite may be reduced for oxidation of alcohols (page 8, lines 12-15).

Claims 1 and 16 have been amended herein to require that the heating recited in independent Claims 1 and 16 is carried out within a temperature range of not less than 80°C to less than 400°C.

Applicants submit concurrently with a Declaration Under 37 C.F.R. § 1.132. In the Declaration a metal hydroxide (potassium hydroxide) and a carrier (alumina) are heated to different temperatures to prepare composites. In Experiment 1 Composite 1 is prepared from a mixture of metal hydroxide powder and carrier powder heated at 450°C for two hours. In comparison Composite 2, prepared in Experiment 2, the same materials are used to prepare a composite however the temperature is 190°C. Composite 1 and composite 2 are treated with

HCl in Experiments 4 and 5 respectively. Composite 1, prepared at a temperature of 450°C, allows recovery of only 70.4% of alumina after washing with the hydrochloric acid and drying. On the other hand Composite 2 which meets the claim limitations allows recovery of 96.1% of the alumina after washing with hydrochloric acid and drying.

Composite 3 and Composite 4, prepared in Experiment 6 and Experiment 7, are prepared by heating a mixture of active carbon and potassium hydroxide powder. Composite 3 is a comparative example which is prepared at 450°C and does not meet the claim limitations. Composite 4 meets the claim limitations. Each of Composite 3 and 4 is subjected to HCl treatment by washing with hydrochloric acid. Composite 3 has an oxygen content in the ECSA of 2.55 wt.% whereas the oxygen content of Composite 4 is 0.96 wt.%.

The data of the Declaration show that heating a mixture of a metal hydroxide and a carrier powder at temperatures above 400°C provides a composite having significantly different characteristics in comparison to a composite prepared at a temperature lying within the range of present independent Claims 1 and 16.

In another aspect of the invention the composite is prepared in an inert gas flow and exhibits no peak derived from the metal hydroxide in the X-ray diffraction intensity curve. The lack of the metal hydroxide peak may indicate that a higher catalytic activity may be obtained from the composite (page 6, lines 14-16). The composite may provide excellent catalytic activity in processes such as isomerization and oxidation (page 7, lines 23-24). Although it is not stated why the claimed composite exhibits improved catalytic activity it is thought that the metal hydroxide may become uniformly dispersed on the carrier surface (page 8, lines 5-7). When the composite additionally does not exhibit a background curve indicating the presence of water, the composite may exhibit higher mechanical strength (page 6, lines 16-18).

The Office rejected Claims 1-19 as anticipated by or obvious over a patent to Hirahara (U.S. 6,064,560).

The Office asserted that the prior art reference discloses heating at temperatures within the ranges claimed in original Claims 2 and 3. Applicants submit that Hirahara does not disclose the heating and drying of a mixture of a carrier in powder form and a metal hydroxide in powder or molten form at a temperature of from 80 to 400°C. For example, Hirahara discloses that the conditions for carbonizing the prior art organic aerogel include a heat treatment at “usually from 400 to 1800°C, preferably from 600 to 1200°C” (column 3, lines 61-67). Hirahara disparages temperatures lower than 400°C stating that the organic substances in the organic aerogel will not decompose (column 4, lines 2-7). Hirahara discloses in Example 6 the reaction of a metal hydroxide with a powder at 800°C. Example 6 is further different from the claimed invention because the heating and drying is carried out on a mixture of the metal hydroxide and powder initially present as an aqueous solution. There is no disclosure that Example 6 is carried out on a mixture of a powdered carrier and a metal hydroxide in a powder or molten form.

Although Hirahara discloses in Preparation Example 1 (column 5, lines 7-10) a reaction temperature of 60° or 90°C, this temperature is not the temperature at which a mixture of a carrier powder and a metal hydroxide in powder or molten form is heated.

Hirahara does not therefore anticipate or render obvious amended independent Claim 1 or amended independent Claim 16.

Applicants traverse the Office’s assertion that the subject matter of original Claim 19 is obvious in view of Hirahara. The Office asserted that Hirahara discloses temperatures of from 400 to 1000°C (page 5 of the Office Action). The Office further asserted that temperatures slightly below 400° would be recognized as sufficient by those of ordinary skill in the art (page 6 of the Office Action). However, as noted above, Hirahara teaches away

from temperatures lower than 400°C by expressly stating that such low temperatures are ineffective at decomposing the organic substances in the prior art organic aerogel (column 4, lines 2-5).

Applicants submit that original Claim 6 is further patentable in view of Hirahara on the grounds that Hirahara does not disclose that the prior art alkali (i.e., metal hydroxide) must be mixed with a material such as an inorganic substance (e.g., silica or alumina as claimed in present Claim 6).

New dependent Claims 26 and 28 are further patentable in view of Hirahara on the grounds that Hirahara nowhere describes isomerization or oxidation processes carried out with a composite adhering to the limitations of present Claim 1.

The Office rejected Claims 1-19 as anticipated by or obvious over a patent to Hamamatsu (U.S. 5,811,611).

The Office asserted that Hamamatsu discloses reaction temperatures of from 80 to 200°C. Although Hamamatsu discloses at column 7, lines 48-51 temperatures that range from 80 to 200°C, more preferably 100 to 180°C, this temperature is relevant to the reaction of an alkyl benzene and a conjugated diene compound in the presence of a catalyst (column 7, lines 45-47).

Example 1 of Hamamatsu discloses heating a mixture of potassium hydroxide and boehmite, both in powdered form. The heating is carried out at 1200°C (column 8, lines 28-31). Similar elevated temperatures are found in the other examples (for example, Example 12, carried out at 1300°C; Example 13, carried out at 900°C; and Example 14, carried out at 1000°C).

Applicants submit that Hamamatsu does not disclose the heating and drying of a mixture of a carrier in powder form and a metal hydroxide in powder or molten form at

temperatures of from 80 to 400°C. Therefore, the subject matter of amended independent Claims 1 and 16 is not anticipated by Hamamatsu.

The Office has asserted that Example 1 discloses the preparation of a catalyst from potassium hydroxide and boehmite to produce a catalyst. However, Example 1 of Hamamatsu includes calcination in an air atmosphere at 1200°C. Therefore Example 1 is not carried out under an inert atmosphere and does not meet the limitations of new dependent Claim 22 and 23. Moreover, the mixing and heating of potassium hydroxide and boehmite of Example 1 of Hamamatsu does not produce a catalyst but rather a support upon which a catalyst may be deposited. In none of the other examples of Hamamatsu is it disclosed that the support (corresponding to the carrier of present Claims 1 and 16) is mixed with a metal hydroxide then heated to provide a composite not exhibiting a peak attributable to a metal hydroxide in the X-ray intensity diffraction curve. Although Hamamatsu discloses the preparation of a catalyst from the precursor which may have been obtained from a metal hydroxide, the catalyst is made by, for example, adding sodium to the support (column 4, lines 12-16) and not sodium hydroxide.

Applicants submit that Claims 7 and 8 of the present application are further patentable in view of Hamamatsu on the grounds that Hamamatsu discloses an inorganic support and not the organic-based support of present Claims 7 and 8.

Applicants therefore submit that amended Claims 1 and 16 are patentable over the prior art relied upon by the Examiner and respectfully request the withdrawal of the rejections.

New dependent Claims 20 and 21 further limit the temperature at which the carrier and the metal hydroxide are heated in independent Claims 1 and 16 to from 80 to 380°C.

New dependent Claims 22 and 23 require that the composite is formed by or obtained by heating a carrier powder and a metal hydroxide in an inert gas and does not exhibit a peak

in the X-ray diffraction intensity curve attributable to the metal hydroxide. None of the prior art references relied upon by the Examiner disclose the limitations of Claims 19, and 22-23.

Hirahara discloses materials that are prepared from organic aerogels and alkali salts (column 2, lines 45-50) but is silent to the absence of a peak attributable to the metal hydroxide in the X-ray diffraction intensity curve.

In the Examples of Hirahara it is disclosed that the prior art compositions are prepared by mixing a carbon aerogel and, for example, potassium hydroxide (see Example 6). The Examples describe mixing the carbon aerogel and potassium hydroxide in a water solution and then heating under a nitrogen atmosphere to an elevated temperature. The resulting material is washed with water several times and then dried. The washing of Hirahara may dissolve and remove any potassium hydroxide. It is nowhere disclosed or suggested that the X-ray diffraction intensity curve must be limited to those curves which do not exhibit a peak attributable to a metal hydroxide. Further it is nowhere disclosed that the heating (i.e., drying) must be carried out under an inert atmosphere.

Hamamatsu likewise does not disclose composites wherein a peak attributable to a metal hydroxide is absent in the X-ray intensity curve of the composite material. The preferred material of Hamamatsu is a material of formula $K_2O \times Al_2O_3$ (column 2, line 43). This material is an inorganic material that functions as a support or carrier, not as a catalyst.

Applicants therefore submit that none of the prior art references relied upon by the Office disclose or suggest all of the present claim limitations and cannot therefore anticipate or render obvious the presently claimed invention. Applicants respectfully request the withdrawal of the rejections and the passage of all now-pending claims to Issue.

Respectfully submitted,

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